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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,422	08/04/2006	Rosangela Pirri	FR-AM 2010 NP	9943
31684	7590	01/30/2009	EXAMINER	
ARKEMA INC. PATENT DEPARTMENT - 26TH FLOOR 2000 MARKET STREET PHILADELPHIA, PA 19103-3222			FINK, BRIEANN R	
			ART UNIT	PAPER NUMBER
			4131	
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			01/30/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/588,422	Applicant(s) PIRRI ET AL.	
	Examiner BRIANN R. FINK	Art Unit 4131	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>08/04/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The use of the trademark Amberlyst 15 has been noted in this application on page 5, l. 23. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-10 and 13-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Giacobbe* (US 5,453,544), in view of *Nierlich et al.* (US 5,994,601).

Giacobbe teaches that thiols can be prepared by the addition of hydrogen sulfide to olefins in the presence of a catalyst, such as an acid catalyst (col. 1, ll. 10-18). This process has been used to prepare tertiary thiols through Markovnikov addition of hydrogen sulfide to a "tertiary" olefin, such as a butylene trimer (Id.).

Giacobbe does not teach the distillation properties of the dodecanthiol mixtures prepared from the butylene trimer.

Nierlich et al. teaches that dibutene is an isomeric mixture formed by the dimerization of n-butene, isobutene or both n-butene and isobutene to give di-n-butene, diisobutene, or dibutene, respectfully (col. 1, ll. 15-22). The dimers are distinguishable by their degree of branching (col.1, ll. 22-24), which is known in the art to effect the boiling point. *Nierlich et al.* teaches that the diisobutene has more highly branched molecules in the mixture of isomers, where di-n-butene has the least amount of branched molecules in the mixture of isomers (col. 24-26). Therefore, one would expect that tri-n-butene would also be less branched than triisobutene. Further, one would also expect that a mixture of tertiary thiols prepared from tri-n-butene would result in thiols with less branching than those prepared with triisobutene, evidenced by *Nierlich et al.* through the teaching of the use of di-n-butene to create nonanols versus diisobutene (col. 1, ll. 32-34).

It is further known in the art that Van der Waals forces are the forces that determine the boiling point of a molecular composition. The strength of these forces depends on the shape and size of the molecule. Molecules with less branching have more contact with each other, resulting in greater Van der Waals forces. Therefore, a molecule with less branching will require more energy to overcome of the forces to reach

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boiling/vaporization, hence a molecule with less branching will have a higher boiling point.

One of ordinary skill in the art at the time the invention was made would have expected a mixture of tert-dodecylthiols to have a higher boiling point (or higher distillation temperatures) when prepared with tri-n-butene as the butylene trimer, versus triisobutylene, in the invention of *Giacobbe*, as evidenced by *Nierlich et al.*, which would be more appropriate for use as a chain-transfer agent in a polymerization requiring higher temperatures.

Claims 14 and 15 can also be rejected as *prima facie* obvious over *Giacobbe* in view of *Nierlich et al.*, as above.

As to claims 3 and 17, *Giacobbe* teaches that sulfonic acid exchange resins can be used to convert olefins to thiols (col. 1, ll. 23-25).

As to claims 4 and 18, *Giacobbe* teaches the use of "AMBERLYST 15" as a sulfonic acid resin catalyst (col. 3, ll. 46-47), which is a copolymer of sulfonated styrene with divinylbenzene as evidenced by the instant specification (p. 5, ll. 21-23).

As to claims 5, 6, 13, and 19, *Giacobbe* teaches a molar ratio of hydrogen sulfide to olefin as 1.5:1 (col. 6, claim 3), whereas the instant invention requires a molar ratio of up to 100 (instant claim 5).

The molar ratio of hydrogen sulfide to olefin is an optimizable parameter. In any reaction, the concentrations of reactants can be manipulated to optimize the process of a routine experimental practice.

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One would be motivated to modify the concentrations of the reactants because *Giacobbe* suggests a molar ratio of hydrogen sulfide to olefin of 1.5, but also mentions that the hydrogen sulfide is present in excess (col. 2, ll. 38) in the production of tert-dodecylthiols.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the molar ratio of hydrogen sulfide to olefin to prepare tert-dodecylthiols with a reasonable expectation of success.

Modifying such a process is *prima facie* obvious because one of ordinary skill in the art would be motivated to optimize the experimental conditions, such as changing the molar ratio of hydrogen sulfide to olefin, to prepare a more efficient product or to explore economical and/or environmental advantages over the prior art, since it is within the scope to optimize experimental conditions through routine experimentation. Merely modifying the process conditions such as temperature and concentration is not a patentable modification absent a showing of criticality. *In re Aller*, 220 F.2d 454, 105 USPQ 233 (CCPA 1955). MPEP 2144.05 (II)

As to claims 7-9 and 20, *Giacobbe* teaches the process of using zeolites as the catalyst for the preparation of tertiary mercaptans (col. 2, ll. 60-64). The preferred reaction temperature is between 70 to 160°C, preferably 90°C (col. 2, ll. 65-67). The pressure is noted as being autogenous (col. 2, ll. 65); however, another procedural embodiment, wherein the reaction pressure decreased from 900 psi (62 bar) to 260 psi

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(18 bar) as the olefin was added, where the pressure was then maintained at 260 psi for the remainder of the reaction.

As to claim 10, *Giacobbe* teaches that thiols can be prepared by the addition of hydrogen sulfide to olefins in the presence of an acid catalyst (col. 1, ll. 10-18).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Giacobbe* (US 5,453,544), in view of *Nierlich et al.* (US 5,994,601), As applied to claim 1, and further in view of *Hall et al.* (US 5,545,677).

Giacobbe in view of *Nierlich et al.* is *prima facie* obvious over claim 1, as noted above; however, neither teach the use of dodecanethiols as a chain transfer agent.

Hall et al. teaches that tert-dodecyl mercaptans are typical chain transfer agents in free radical polymerizations (col. 6, ll. 18-19 and 29-30).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the dodecanethiols of *Giacobbe* in view of *Nierlich et al.* as a chain transfer agent in a free

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radical polymerization as suggested by *Hall et al.* because they would be able to withstand higher temperatures of copolymerization if so desired.

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Giacobbe* (US 5,453,544), in view of *Nierlich et al.* (US 5,994,601), As applied to claim 1, and further in view of *Arretz* (US 6,228,006).

Giacobbe in view of *Nierlich et al.* is *prima facie* obvious over claim 1, as noted above; however, neither teach the use of dodecanethiols in the synthesis of di(tert-dodecyl) polysulfides.

Arretz teaches that polysulphides can be obtained by the reaction of a mercaptan with sulphur in the presence of a basic catalyst (col. 6, ll. 49-51). Further, *Arretz* teaches that the tertiary mercaptan incorporated into the reaction can be present in mixtures, and must have boiling points high enough to withstand the high temperatures required by the reaction; therefore, they must have a boiling point of higher than 150°C, preferably higher than 180°C (col. 6, ll. 32-40). A preferred tertiary mercaptan is tert-dodecyl mercaptan (col. 6, ll. 41-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the dodecanethiols of *Giacobbe* in view of *Nierlich et al.* in a reaction for the synthesis of di(tert-dodecyl) polysulfides as suggested by *Arretz* because the use of tri-n-butene versus triisobutene results in dodecanethiols with higher distillation temperatures, and therefore higher boiling points, as explained above,

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allowing for the thiols to withstand the high reaction temperatures needed for the synthesis of polysulphides.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRIEANN R. FINK whose telephone number is (571)270-7344. The examiner can normally be reached on Monday through Friday, 7:00 AM to 4:30 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Sample can be reached on (571)272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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/David R. Sample/
Supervisory Patent Examiner
Art Unit 4131

/B. R. F./
Examiner, Art Unit 4131